



(11) **EP 1 467 411 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
05.03.2008 Bulletin 2008/10

(51) Int Cl.:
H01L 29/78 (2006.01) **H01L 29/08** (2006.01)
H01L 29/10 (2006.01)

(43) Date of publication A2:
13.10.2004 Bulletin 2004/42

(21) Application number: **04012849.8**

(22) Date of filing: **31.01.2000**

(84) Designated Contracting States:
DE FR GB IT NL

(30) Priority: **05.02.1999 US 245030**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
00905849.6 / 1 163 700

(71) Applicant: **Power Integrations, Inc.**
San Jose,
California 95138 (US)

(72) Inventors:

- Rumennik, Vladimir
Los Altos, CA 94022 (US)
- Disney, Donald R.
Cupertino, CA 95014 (US)
- Ajit, Janardhanan S.
Sunnyvale, CA 94086 (US)

(74) Representative: **Wombwell, Francis et al**
Potts, Kerr & Co.
15, Hamilton Square
Birkenhead
Merseyside CH41 6BR (GB)

(54) **High-voltage field-effect transistor**

(57) A high voltage insulated gate field-effect transistor includes an insulated gate field-effect device structure having a source (14) and a drain (19), the drain (19) being formed with an extended well region (17) having one or more buried layers (18) of opposite conduction

type sandwiched therein. The one or more buried layers (18) create an associated plurality of parallel JFET conduction channels in the extended portion of the well region. The parallel JFET conduction channels provide the HVFET with a low on-state resistance.

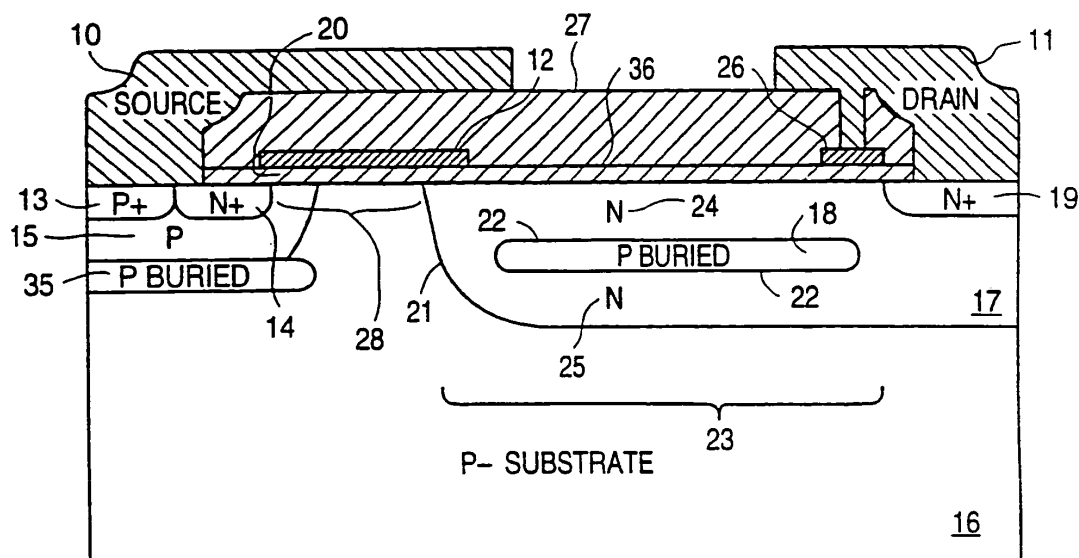


FIG. 1



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 01 2849

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 98/20562 A (POWER INTEGRATIONS INC) 14 May 1998 (1998-05-14)	1-5, 10-13	INV. H01L29/78
Y	* page 8, line 9 - page 12, line 19; figures 2,4 *	6-9, 14-21	H01L29/06 H01L29/08 H01L21/336 H01L21/266 H01L21/74 H01L29/10
D,Y	----- US 5 258 636 A (RUMENNIK V ET AL) 2 November 1993 (1993-11-02) * column 3, line 4 - column 4, line 50; figures 3,4A-4B,5 *	6,7, 14-21	ADD. H01L29/40 H01L29/10 H01L29/417 H01L29/423
X	GB 2 309 336 A (FUJII ELECTRIC CO LTD) 23 July 1997 (1997-07-23)	1,2,4,5	
Y		8	
A	* page 43, line 4 - page 46, line 14; figure 11 *	14	
	* page 39, line 1 - page 41, line 8; figures 9A-9C *		
	* page 37, line 15 - line 17 *		
Y	----- US 4 949 137 A (MATSUZAKI H ET AL) 14 August 1990 (1990-08-14) * column 3, line 40 - line 46; figure 1 *	9	
D,X	----- US 5 313 082 A (EKLUND K H) 17 May 1994 (1994-05-17)	1,2,4,5, 8	
A	* column 2, line 51 - column 3, line 62; figures 1A-1B *	14	
D,A	----- US 4 811 075 A (EKLUND K H) 7 March 1989 (1989-03-07) * column 2, line 32 - column 3, line 47; figure 1 *	1,14	

The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 January 2008	Examiner Morvan, Denis
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

4
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 01 2849

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-01-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9820562	A	14-05-1998	US 6168983 B1	02-01-2001
			US 6207994 B1	27-03-2001

US 5258636	A	02-11-1993	DE 69224709 D1	16-04-1998
			DE 69224709 T2	29-10-1998
			EP 0546377 A2	16-06-1993
			JP 2781504 B2	30-07-1998
			JP 5259454 A	08-10-1993

GB 2309336	A	23-07-1997	DE 19702102 A1	24-07-1997
			US 6097063 A	01-08-2000

US 4949137	A	14-08-1990	JP 1303761 A	07-12-1989
			JP 2040381 C	28-03-1996
			JP 7075260 B	09-08-1995

US 5313082	A	17-05-1994	DE 69404500 D1	04-09-1997
			DE 69404500 T2	26-02-1998
			EP 0612110 A1	24-08-1994
			JP 3631773 B2	23-03-2005
			JP 6291263 A	18-10-1994
			JP 2004247754 A	02-09-2004

US 4811075	A	07-03-1989	DE 3861707 D1	07-03-1991
			EP 0295391 A1	21-12-1988
			JP 2529717 B2	04-09-1996
			JP 63314869 A	22-12-1988
			JP 2804460 B2	24-09-1998
			JP 8172184 A	02-07-1996
